

FLOTEM IIe TECHNICAL MAINTENANCE MANUAL

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Rev. 7.2

Models 003825A (115 volt)
003830A (230 volt)
40 DEGREE C UNIT

000401A

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INTRODUCTION

Thermal shock or patient discomfort can result from a rapid infusion of as little as 500-1500 ml of fluid at a temperature below a patient's body temperature. For this reason, cold I.V. fluids must be given slowly, wasting precious time. The FloTem IIe - Blood/Fluid Warmer alleviates this problem by bringing the external heat to the I.V. tubing and thus, to the actual fluid being administered. FloTem IIe accurately warms the fluid to proper temperature by the time it exits the FloTem IIe and keeps the temperature constant during infusion. FloTem IIe precludes any patient distress while it shortens the infusion time. FloTem IIe is ideal for the operating room, ICU floors and pediatric wings.

FloTem IIe is designed to relieve the complications associated with infusing cold blood or intravenous solutions. It also avoids problems associated with waterbath or fluid bags which require lengthy and complicated set-ups and which may cause contamination from the waterbath. Instead, FloTem IIe uses standard I.V. sets and/or blood sets with a dry heat system. FloTem IIe is an electronically controlled solid state unit. This provides accuracy in controlling the heating source and allows FloTem IIe to be ready for use easily and quickly.

FEATURES

The heating plates are made of aluminum which is lightweight and a good conductor of heat.

FloTem IIe has four different exit channels for the I.V. tubing to adapt easily to most all standard tubing sets.

FloTem IIe is equipped with an LCD temperature readout to indicate when the desired temperature has been reached in the heating plates.

FloTem IIe has solid state control circuit to keep plate temperature between 39.5 and 40.5 degrees.

FloTem IIe has two grooved heating plates to improve heat transfer to the fluid being warmed.

FloTem IIe has a lightweight, high impact, flame retardant plastic case making the total unit weight under 6 lbs.

The FloTem IIe is equipped with "TRIPLE TEMPERATURE PROTECTION".

This unit has three independent temperature sensor circuits. The first provides power to the heaters via a solid state oscillator control. This temperature is directly indicated on the LCD display.

If the main control circuit should ever fail, a second solid state sensor control circuit will activate an audible alarm at 41.0 ± 0.3 degree C and turn off power to the heaters by deactivating the main control circuit and the power control relay that supplies the 115 VAC source for the heaters.

The third sensor stage is a set of mechanical bi-metal thermostats that are independent of the solid state control circuitry and provide a second safety in the event of a catastrophic failure of both electronic circuits. One thermostat control is mounted directly to each plate and wired in series with each heater so that if plate temperature ever reaches 42 degrees C. \pm 1 degree C., the thermostat will cut power to the heater.

UNIT CHECK LIST

Qty	DataChem Stock No.	Description	Use
1	000402A	Operating Instruction Manual	User Ref.
1	000401A	Maintenance Manual	Tech. Ref.
1	003825A	FloTem Iie Blood Warmer	

EQUIPMENT LIST NOT SUPPLIED (REPAIRS & MAINT.)

<u>QTY</u>	<u>DESCRIPTION</u>	<u>MANF.</u>	<u>MODEL#</u>	<u>WHEN NEEDED</u>
1*	Soldering Iron 40W	Weller	WP 40	Rep. & Assy
1*	De-soldering tool			Rep. & Assy
1*	Digital Multimeter	Micronta	22-185A	Rep. & Assy
1	Electrical Analyzer	DynaTech	231C	Safety Chk.
1*	Anti-Static Calib.Tool	GC	AS 8608	Rep./ReCal
1*	Digital Thermometer	B&D	403000	Rep./ReCal
1*	Wrist strap & grounding			
	cord.Antistatic protection #3m		-----	All
1	Hi pot tester 1100vac	DataChem	DCHP1	QC/Safety

NOTE: # = Different manufacturer is accepted with like unit specifications.

1* = One unit needed per test or repair station.

WARNINGS

NOTICE: The FloTem IIe should not be operated within (3) three feet of any type electrosurgical cutting equipment. **IMPORTANT:** The RF radiations from this type of cutting equipment has been known to cause mal-functions in the FloTem IIe warmer unit.

DANGER !: The FloTem IIe could be an explosion **HAZARD** when used in the presence of flammable anesthetics.

WARNING !: In case the alarm sounds, unplug or switch off the warmer unit. If the alarm sounds frequently, the unit is malfunctioning and may be in need of repair or re-calibration.

For continued protection against risk of fire, replace only with same type and rating of fuses.

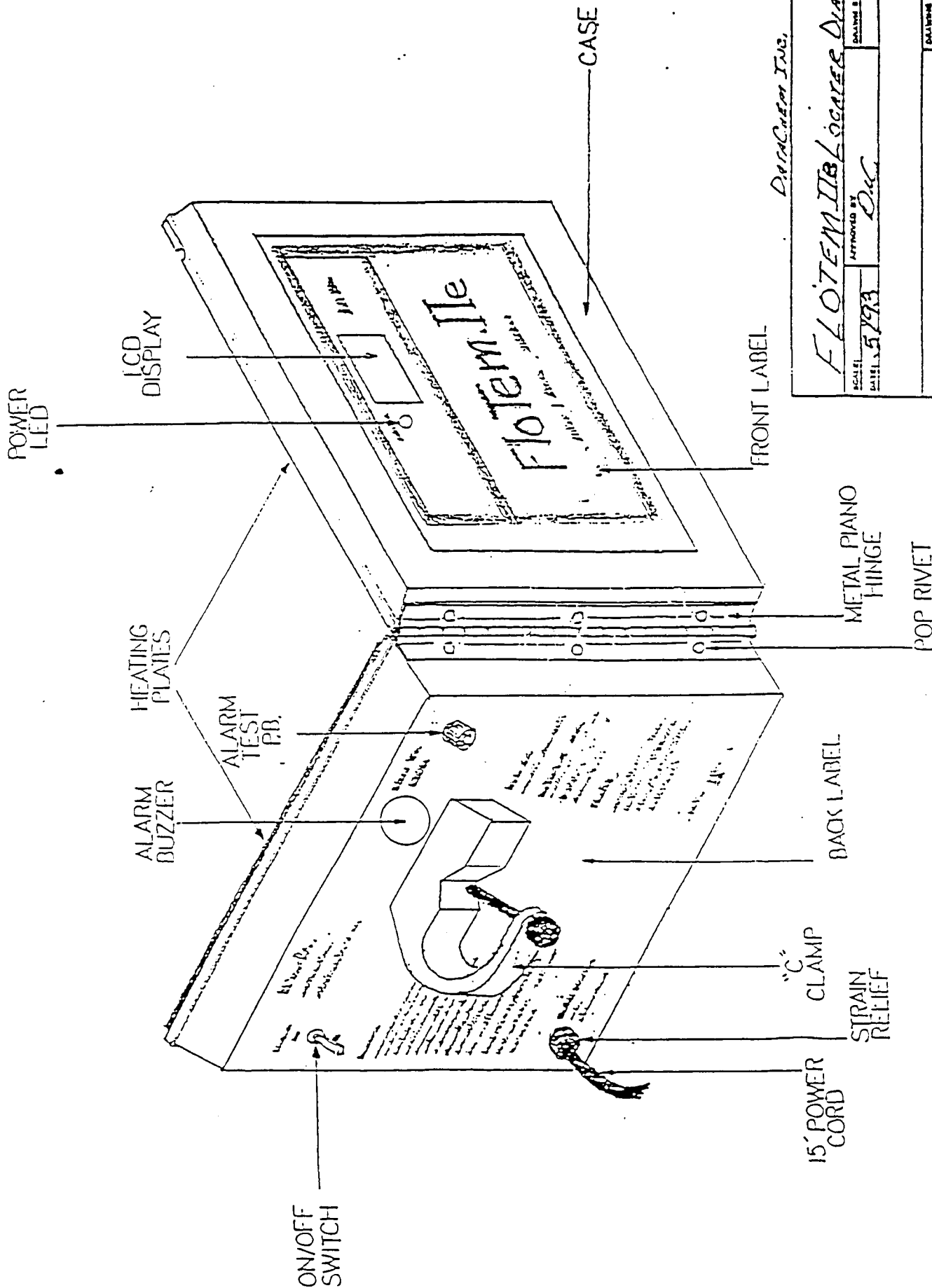
To reduce risk of electric shock, DO NOT remove cover (or back). Refer servicing to qualified service personnel only!

IMPORTANT:

The doors of the FloTem IIe must be closed at all times during warming of fluids. Leaving the doors un-latched can cause uneven heating.

Units are supplied from the factory to customer specification to operate from either a 120 volt 60 Hz AC grounded power supply or 240 volt 50 Hz AC operation. Units should not be converted in the field to operate at a different supply voltage than set at the factory during the manufacture of the product.

NOTE: If a 115 VAC unit is operated from a 230 VAC source, the unit may appear to operate correctly for a short period of time. If use is continued for more than approx. 30 seconds, the unit will be damaged and could catch fire.



DuraCure Inc.

FLOTEM.Ile LOCATOR DIAGRAM

SCALE: DATE: 5/93 APPROVED BY: DUC DRAWN BY: CLP

DRAWING NUMBER

1003

PAGE 4. OPER. INST. MAN.

LIMITED WARRANTY

Electronic parts and labor of the FloTem IIE Blood/Fluid Warmer are guaranteed for one (1) year from the date of shipment to the original purchaser. The limited warranty covers the FloTem IIE when used according to the procedures provided and under normal conditions. If any defects or damage to the FloTem IIE is noticed on arrival at the Original Purchaser's facility, DataChem should be immediately notified to protect the limited warranty. The limited Warranty does not cover any equipment subjected to any misuse, abuse, modification or alterations. If the FloTem IIE is damaged under normal operation condition, the company will either repair the unit or in the case of a defect, replace the necessary parts. Handling charges will be paid by the original purchaser. Limited Warranty DOES NOT cover the C-clamp or the PLASTIC CASE.

Warranty registration must be sent to DataChem Inc. within (10) ten days of the date of purchase. In absence of receiving the warranty registration for the FloTem IIE, DataChem, Inc. will cover only a (90) ninety day warranty.

DataChem, Inc. reserves the right to change or revise any component or operating conditions of the FloTem IIE Blood/Fluid Warmer without being obligated to make corresponding changes or revisions in previously sold FloTem IIE Blood/Fluid Warmers.

FloTem is a registered trade mark for blood/fluid warmer.
DataChem is a registered trade mark for DataChem Inc.
U.S. Patent No. 4,532,414 Printed U.S.A. Copyright 1988
DataChem Inc. 2320 Michigan Court Arlington, TX 76016 U.S.A.

SERVICE AND MAINTENANCE

Only qualified Electronic Technicians should repair or calibrate the FloTem IIE after the warranty period. If a qualified Electronic Technician is not available, the FloTem IIE should be returned to DataChem Inc. with the proper return authorization given by DataChem, Inc. DataChem, Inc. will NOT provide detailed guidance to repair the FloTem IIE on the telephone. In such an event, the customer will be responsible for consultation charges.

SHIPPING AND HANDLING PRECAUTIONS

Always return the FloTem IIE in original shipping carton when return is needed. Units damaged during shipping that have not been packed in their original shipping carton will terminate all applicable existing warranties given by DataChem Inc.

All DataChem equipment should be marked on the packaging with "FRAGILE". NOTE: Equipment will not be accepted at DataChem without a RETURN AUTHORIZATION NUMBER showing on the outer package and packing list

EQUIPMENT STORAGE INFORMATION

The FloTem IIe must be stored in a **CONTROLLED** environment as shown below:

- 1.) Temperature from +15.0 degrees C to +40.0 degrees C.
- 2.) Relative humidity from 5% to 95%.

NOTE: Units placed in storage for more than 6 months should be re-calibrated and tested before use.

UNPACKING AND INITIAL TESTING INSTRUCTIONS

Cut or remove tape from top of corrugated shipping carton and open flaps. **NOTE:** Unit manuals may be packed at top and or side of carton. Remove packing material. Remove FloTem by the attached "C" clamp on the back of the unit. The FloTem IIe when removed from the packing should be ready to use. The unit should be inspected for damage upon opening packaging. Inspect for cracks in plastic case and loose screws in plates. Remove the QC slip inside the unit by opening the latch at the right hand side of the unit. An operational check may now be performed in about three (3) minutes.

NOTE: The FloTem when new is set for **115 VAC OPERATION**, unless otherwise noted on the back label. **DO NOT** plug into a **230 VAC** receptacle!

After plugging the unit into the proper power supply, turn the power switch on the back of the unit on (see drawing 1003 page 4). The green LED, labeled power, should be on. Allow it about 2-3 minutes to warm up. The LCD display should read approximately 40.0. A normal overshoot temperature will occur when the unit is turned on from a cold start. If the audible alarm sounds and or the unit never warms to a reading of 40.0 then something may be wrong with the unit. If this should occur, the unit and its packing accessories should be returned to DataChem Inc. for repair or exchange. Send defective units to:

DataChem, Inc.
2320 Michigan Court
Arlington, TX 76016

ATTN: RA# _____ (Return Authorization Number must be given from a DataChem Representative before returning any items) Phone: (817) 861-0101 FAX: (817) 861-9476.

OPERATION

FloTem IIe is ideal for use with commercially available 4mm OD I.V. blood sets. The I.V. tubing is simply and easily placed first through the right hand heating plate and then through the left hand heating plate via the serpentine channels (see drawing 1002 page 8). Determination of what exit channel to use will be based on the maximum flow rate that will be needed during the infusion. Flow must always begin from the top right hand side of the unit and exit through one of the four channels at the lower left hand side of the unit.

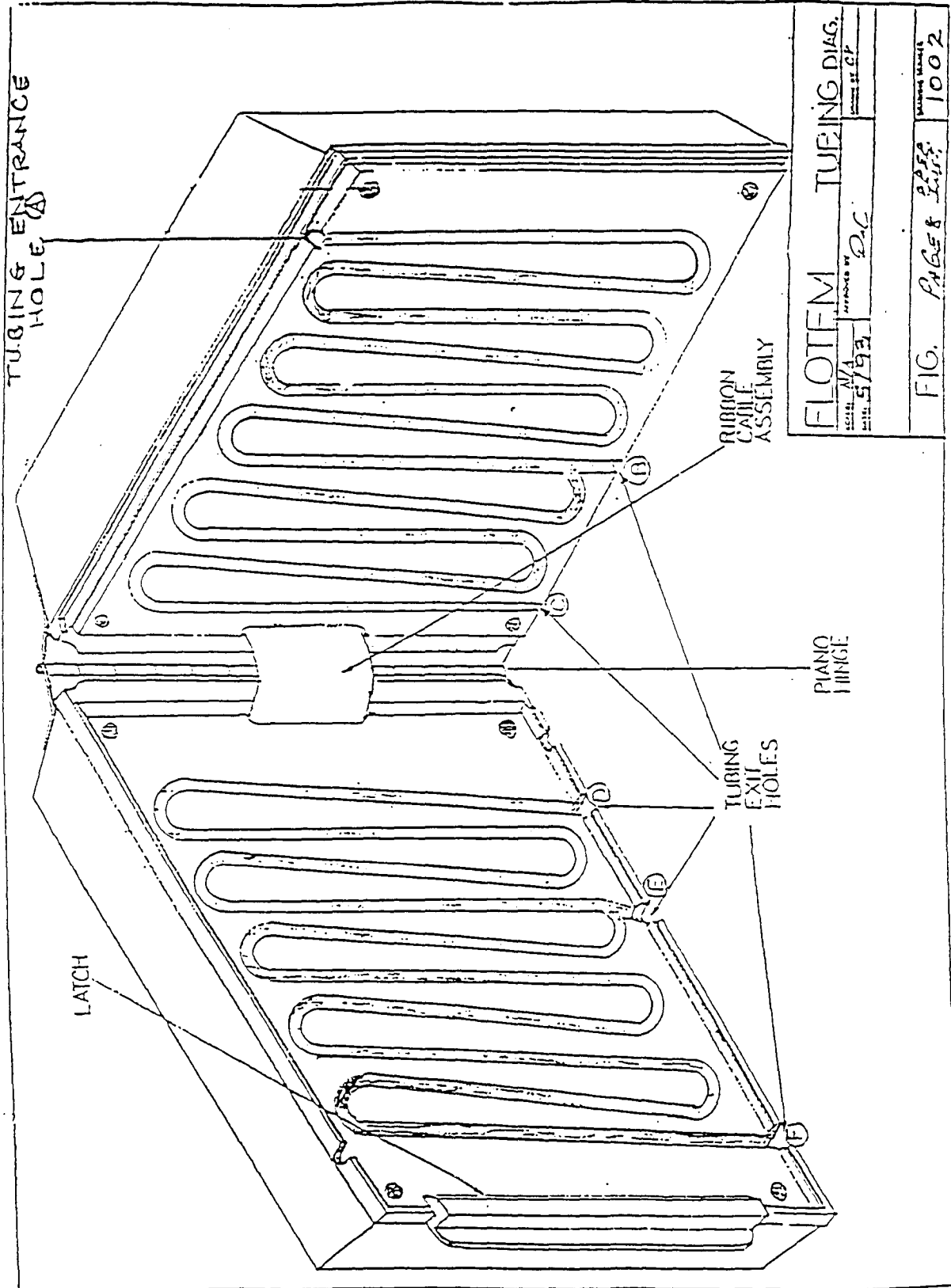
The temperature of the aluminum heating plates is displayed by the LCD digital readout at the front of the unit. The Green LED next to the display indicates that power is applied to the unit (see drawing 1003 page 4).

START UP PROCEDURE

- 1.) Mount the unit on an I.V. pole by use of the "C" clamp on the back of the FloTem IIe.
- 2.) Plug the AC power cord into a grounded (3) prong receptacle and turn the power switch on (UP). The switch is located on the back of the unit. **NOTE:** Allow the unit to **WARM UP** to 40 degrees C (shown by the display) **BEFORE** allowing liquid to flow through the tubing set.
- 3.) Facing the warmer, place hand on the back side of the latch. While pulling the latch toward you, curl fingers inward and open the door.
- 4.) (From drawing 1002 page 8), lay I.V. tubing into the Channel (Ent. A) so that when clamped onto the I.V. pole, fluid will enter from the top right and exit from the bottom left as shown in drawing 1002.
- 5.) Exit channel selection: (Reference drawing 1002 page 8)
 - a) For flow rates of about 5ml-15ml/min, Exit Channel "B" should give adequate heat transfer.
 - b) For flow rates of about 15ml-40ml/min, Exit Channel "C" should give adequate heat transfer.
 - c) For flow rates of over 40ml/min, Exit Channel "C", then re-enter through channel "D" the Exit Channel "E". This should give adequate heat transfer.
 - d) For maximum heat transfer to the liquid, use the entire channel length by exiting channel "C", re-enter through channel "D", then exit through "F".

NOTE: These suggestions of channel selection are based on an incoming liquid temperature of 7 degrees C. The results listed above are taken from testing done at the DataChem Inc. laboratories and your actual results may vary.

6.) **IN EMERGENCY SITUATIONS:** Tubing may be inserted upon turning power on to the unit and used with a minimum amount of warming. (standard warming time is approximately 2-3 minutes., set-up time is approximately 1/2 - 1 minute).



FLOTEN TUEING DIAG.	
DATE: 5/93	DESIGNED BY: D.C.
FIG. PAGE 8 OF 1002	

CALIBRATION TEST MAINTENANCE RECOMMENDATIONS

The FloTem IIe does not require mandatory replacement of parts after specific durations. However, it is advised that these units be tested once per month or 50 hours of operation, whichever comes first.

Calibration of the FloTem IIe can be tested by use of a thermometer such as the B&D model # 403000 digital. The unit should be on for at least 10-15 minutes without I.V. tubing in it.

1. Take any I.V. tubing that may be in the FloTem IIe out.
2. Close the door on the unit and plug into a 110VAC outlet.
3. Turn the power switch located on the back of the unit on and allow the FloTem IIe to warm up and stabilize (Approx. 10-15 minutes).
4. Insert a glass or digital thermometer into the upper right inlet (see drawing 1002 page 8) and allow thermometer to rise to temperature.
5. With the LCD display on the FloTem IIe at 40.0 degrees C., the thermometer should read 40.0 degrees C \pm .3 degrees C.

ALARM TESTING

Turn on unit and allow to warm up to normal operating temperature of 40.0 degrees C. Then press the alarm test button located on the back of the FloTem IIe (see drawing 1003 page 4) and hold the button in while watching the temperature rise via the LCD display on the front of the FloTem IIe. When the LCD display shows 40.3 degrees C., release your finger from the test button. The temperature should continue to rise and at 41.0 degrees C \pm 0.3 degree C the audible alarm will sound.

WARNING: In case alarm sounds during normal operation, turn the power switch off and allow to cool. If alarm sounds frequently, the FloTem IIe is malfunctioning and needs repair. For continued protection against risk of fire, replace only with the same type and rating of fuses. **To reduce the risk of electrical shock, do not remove the cover (or back).**

EQUIPMENT CARE

FloTem IIe should be cleaned and sanitized after each use by use of a soft cloth and proper cleaning solution. **NOTE:** that the heating plates are painted with a teflon coating manufactured by Dupont # 954-103.

USER TROUBLESHOOTING

SYMPTOM

POSSIBLE CAUSE

Alarm sounds after warm-up sequence but shuts off after a few minutes.

Unit may be slightly out of calibration and or room (ambient) temperature may be too low. This is called overshoot and will not effect unit operation.

Power LED not on.

Unit is not plugged in to AC receptacle? Power switch is off?

LCD display jumps between 39.9 & 40.1

This is normal in both high flow rate and 230 VAC unit applications.

Unit sluggish, not warming properly.

Is this a 230 VAC unit operating in a 115 VAC receptacle

I.V. fluid or blood not flowing properly.

I.V. tubing pinched within unit. Is liquid bag above warmer? It should be. Is warmer above the patient? It should be.

Door pops open.

Problem with tubing(see set-up procedure).

Alarms upon turning power switch on.

Ribbon cable or temperature sensor not properly connected.
SEND FOR REPAIR.

SPECIFICATIONS

Parameter	Description
Control circuit	Solid-state integrated circuit
Input Voltage	110-120 VAC or (220-240 VAC "Special Order").
Input Frequency	60 Hz @ 115 VAC or (50 Hz @ 230 VAC "Special Order")
Input power	330 watts max. / 3 amps.
Current leakage	Less than 50 microamps at 115 VAC. Less than 100 microamps at 230 VAC; using hospital grade cord provided.
Power cord resistance	Less than 150 m Ohms @ 115VAC test.
Exterior cabinet	High impact/ plastic/ metal hinge.
Plate material	Aluminum channeled with a black teflon coating by Dupont #954-103.
Dimensions	8"(L) x 6" (H) x 2"(D) or 23.3 cm(L) x 15.3cm (H) x 5cm (D).
Weight	Less than 6.0 LBS. or 2.75 KG.
Warm up time	Within 2 to 3 minutes.
Safety features	Independent audio alarm; automatic power cut-off to heating plates; separate in-line overtemperature thermostats cutting power to heating plates; LCD digital readout for actual plate temperature in degrees C.

ORDERING INFORMATION

ORDERS:

Orders for Flotem equipment, parts and supplies can be placed through a stocking distributor or directly through the main office. Service requests must be made directly to the main office at the following address:

DataChem, Inc.
2320 Michigan Court
Arlington, TX 76016
(817) 861-0101
or
(800) 777-4282
Email manley@cvcinc.com

TERMS:

All invoices payable in 30 days to DataChem Inc. offices in Arlington, Texas. Shipping net f.o.b. DataChem Inc. manufacturing plant Lafayette, IN. Shipping and handling charges will be prepaid and added to the invoice. Late payments will be assessed a 2.0% interest charge per month. Credit will be refused to accounts 90 days delinquent.

MINIMUM ORDERS:

Orders placed must be for goods or services totaling no less than \$100.00 unless product plus shipping and handling charges are prepaid. DataChem will accept pre-payment or agree to ship C.O.D.. For orders above \$100.00, the NET 30 day terms shown above become applicable. Such terms must be specified at the time of purchase request.

RETURNS:

No returns will be accepted without prior authorization from DataChem, Inc.. DataChem, must be notified of any shortages or items damaged in transit within 10 days of receipt of merchandise. Failure to report damaged or missing equipment within the specified time will make the purchaser liable for repairs or replacement. DataChem reserves the right to determine the cause of equipment failure or damage.

DataChem, Inc. reserves the right to change
its price lists without notice.

FLOTEM IIe TECHNICAL MANUAL

INTRODUCTION:

DataChem, Inc. would like to thank you for your selection of the FloTem IIe blood/fluid warmer. This warmer has been designed to give the user years of trouble free service. While DataChem, Inc. does not regard the FloTem IIe as a user serviceable instrument, information will be given in this manual that will allow a qualified technician to test the operation of the warmer, check and reset the temperature calibration points, and do some troubleshooting to trace down a fault in the unit.

The FloTem IIe comes from the factory set to operate at 40 degree C. However, the FloTem IIe may be special ordered from the factory set to one of three different control set temperatures such as 37.0 degree C, or 41 degree C, or 42 degree C. The units cannot be changed in the field from the factory set temperature.

In the case the unit is set at the factory to a different control temperature than 40 degree C, the alarm temperature will also be set accordingly. For example:

UNIT SET TEMPERATURE	ALARM SET TEMPERATURE
40 degree C	41.0 \pm 0.3 degree C
37 degree C	38.0 \pm 0.3 degree C
41 degree C	42.0 \pm 0.3 degree C
42 degree C	43.0 \pm 0.3 degree C

If a different set unit is ordered, the calibrations are done exactly the same except for the different set and alarm temperatures.

OPERATION:

To test a FloTem IIe blood/fluid warmer, plug in the unit and turn it on. The LCD display on the front of the warmer will show the plate temperature in degrees centigrade (C). The display reading will increase fairly quickly until the set point temperature is reached. The display will overshoot slightly then the unit will cool down and maintain the set point temperature.

The FloTem IIe has been designed to maintain a constant heating plate temperature of 40.0 degrees C. Actual fluid temperature can not be measured as this would cause contamination. The temperature is controlled through a solid state temperature sensor located in the grooved plate on the right hand side of the unit. A second temperature sensor in the same plate is used to sound an audible alarm and disable the AC power to the heating pads if the plate temperature ever reaches 41.0 degrees C \pm 0.3 degrees C. Power to the heating pads will always be turned off when the alarm sounds, but a small temperature overshoot may be observed due to a heating time lag.

There is an alarm test switch located on the back panel of the warmer. When this switch is enabled the main control circuit will be overridden causing the plates to overheat. The alarm will sound when its set point temperature is reached and the power to the heating pads will be turned off. The test switch should now be disabled but the alarm will continue to sound until the plates cool down or the warmer is turned off.

CALIBRATION:

To check the temperature calibration of a FloTem IIe blood/fluid warmer, turn on the unit and allow the temperature to stabilize for approximately ten minutes. With the unit closed, insert an accurate glass or digital thermometer into the tubing inlet on the top of the warmer. After the thermometer has stabilized compare the reading to the display reading of the warmer. The readings should match to within ± 0.3 degrees C.

The alarm set point can now be checked by enabling the alarm test switch on the back of the warmer unit and comparing the display and thermometer readings when the alarm first sounds. This temperature should also be within ± 0.3 degrees C.

If these set point temperatures are not within their tolerances, the warmer needs to be recalibrated. Unplug the unit and open the warmer. Remove the four plate mounting screws on the display side of the unit. Now fold back the display plate so that it lays flat against the main heating plate. Apply power to the unit and allow the LCD reading to stabilize at the units set temperature. Be careful when handling the unit as the thermostat and heating pad leads will be live with 110V AC.

Once the unit has stabilized, insert a thermometer into the tubing inlet between the heating plates as before. When the thermometer has stabilized, compare the reading to the display of the warmer. If they do not match, adjust R14 on the display board until the display indicates the same temperature as the thermometer. Once this adjustment is made, allow the unit to stabilize again at the units set temperature, then repeat the adjustment procedure again if necessary until the thermometer and the display reading match.

With the warmer stabilized at the units set temperature, test the alarm set point by pressing and holding the alarm test switch (pressed in) on the back of unit until display reaches 0.3 degree C above the set point of the unit, then release the alarm test button. The temperature will continue to rise after releasing the test button. Note at what temperature the alarm first sounds. This should occur at $+1.0$ degrees C ± 0.3 degree C above the units set temperature. If it does not, allow the unit to cool and stabilize again to the unit set temperature. Press the alarm test switch and adjust R13 on the display board so that the alarm sounds at $+1.0$ degree C ± 0.3 degrees C. Repeat this procedure until the alarm set point is reached.

Once these adjustments have been made, unplug the unit and install the display plate back into the unit. Close the unit and test it again from a cold start to ensure that the calibration procedure has been done successfully. Recalibrate the unit if necessary until the temperature and alarm settings are within tolerance.

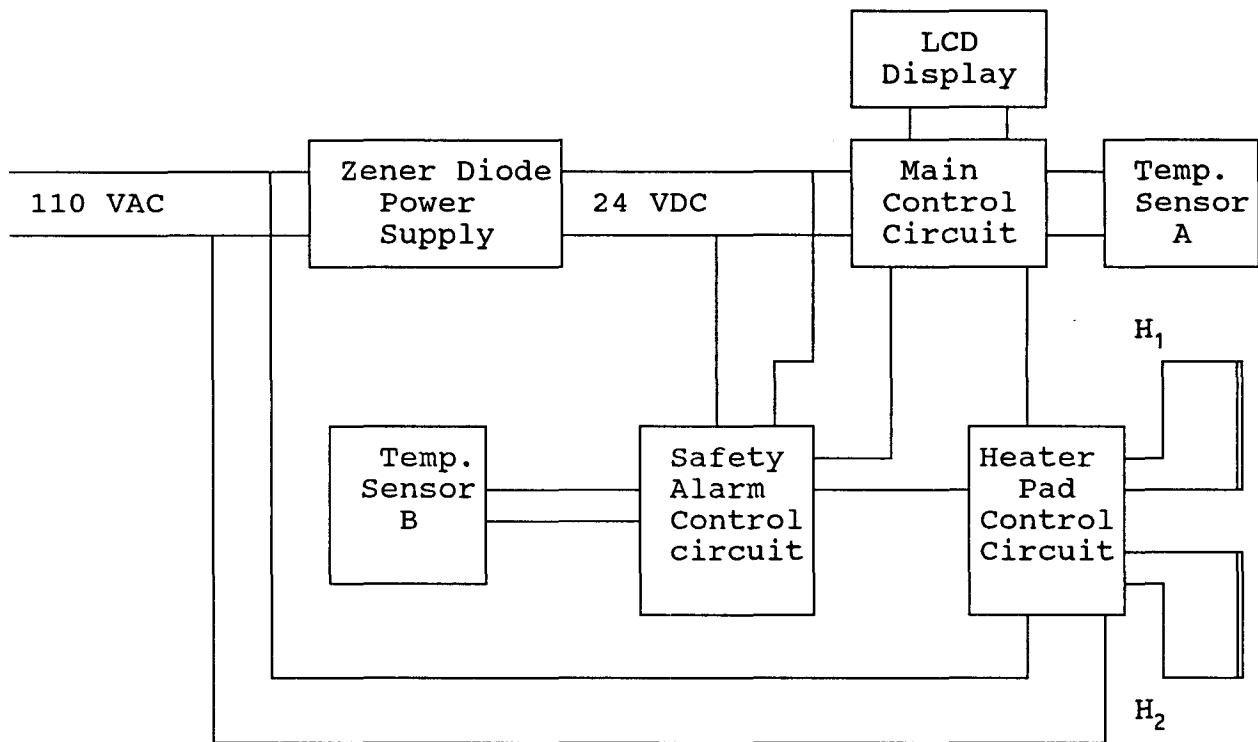
CIRCUIT DESCRIPTION:

Overview: The FloTem IIe I contains two circuit boards: the power board and display board. The two boards are interfaced by a 16 pin ribbon cable. There are two grooved heating plates, both of which have a heating pad secured to the plate. The heating pads are connected in series with a bi-metal thermostat mounted on each plate. The thermostats monitor the plate temperature and cut off current to the heat pads if both the main and alarm control circuits fail simultaneously. These heat pads and thermostats are connected to the power board through the PCB mounted terminal block.

Power Board: The power board contains the 12VDC and 24VDC power supplies and the driver circuitry for the heating and alarm functions. Triac Q1 provides 110Vac to the heating pads and is driven by optoisolator U1. Relay K1 is energized to complete the electrical circuit path between Q1 and the heating pads H1 and H2. A 12V buzzer provides an audible alarm in case of an over temperature situation. When this occurs, relay K1 is de-energized, opening the heating circuit. U4 is an open collector Darlington driver which drives the heating, relay, and alarm circuitry. U3 is a switching regulator which provides a 25 Vpp square wave to transformer T1. U2 is an optoisolator used to activate the alarm test function when switch SW2 is depressed. The 5V for this function originates from the display board through pin 14 of J1. R12 and R13 are both 10K NTC thermistors mounted in the main heating plate. These are the temperature sensors for the alarm and temperature controls.

DISPLAY BOARD: The display board contains a microcontroller unit, the LCD display, display driver circuitry, and the temperature and alarm circuitry. The microcontroller unit U2 is a one time programmable processor that controls all functions of the warmer unit. It activates all driver circuitry on the power board through the 16 pin ribbon cable. Along with shift registers U3 and U4, it also drives the LCD. Zener diode D4 provides the 5V power supply. Comparator U6 along with R13 and R14 determine the alarm and temperature settings. Resonator X1 oscillates at 4MHz providing the clock signal to the microcontroller unit.

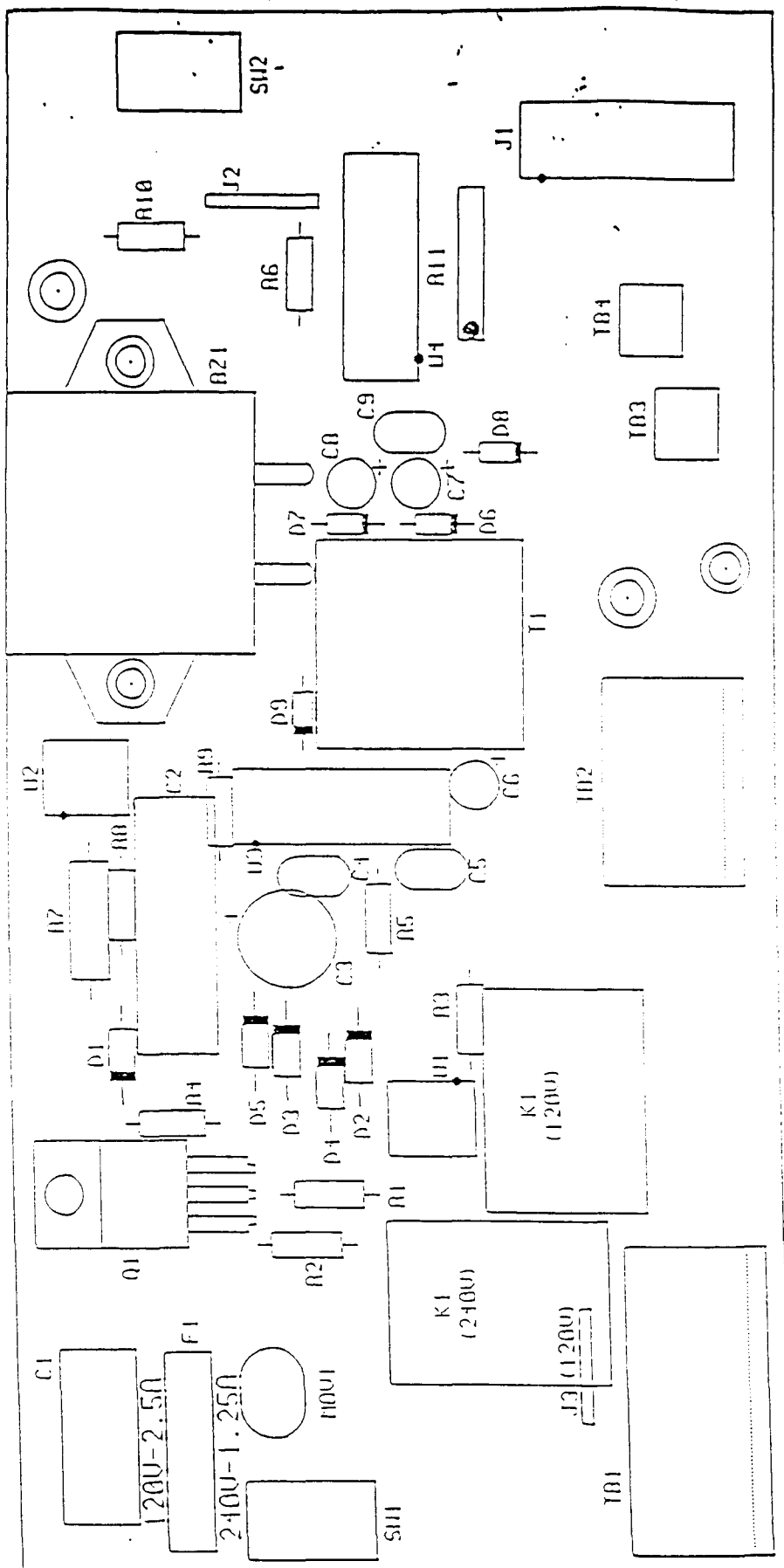
FLOTEM IIe BLOCK DIAGRAM
Drawing # 1130



TroubleShooting Guide

Symptom	Possible Cause
Unit doesn't turn on, power LED doesn't come on	Check fuse F1 of power board. See if solder connections to ON/OFF switch are broken
Unit alarms and displays "Err" when turned on	Check for open or shorted temperature sensors
Unit heats up and doesn't cool down	Check AC is applied across the heating pads after the unit passes 40 degrees C. If so the triac Q1 is probably bad. If not it could be a bad triac driver (U1) on power board
Unit doesn't heat up at all	Check to see that both of the heating pads are properly connected to TB2 on the power board. Check the resistance of the heating pads. They should be about 90 ohms each
Unit upon being turned on has no power LED or LCD operation	See if ribbon cable is connected properly to J1 of power board
Unit has erratic display, not heating	Power down the unit to "reset" the micro-controller. Power up and test

Symptom	Possible Cause
LCD comes on when unit is first turned on but then fades out	Look for a solder, or other type of short on the display board
Unit overshoots target temperature and alarms	Make sure the temperature sensors go down into the holes in the heating plate all the way and are secure. Make sure the heating pads are stuck firmly to heating plates
Unit has high current leakage	Probably a bad thermostat.

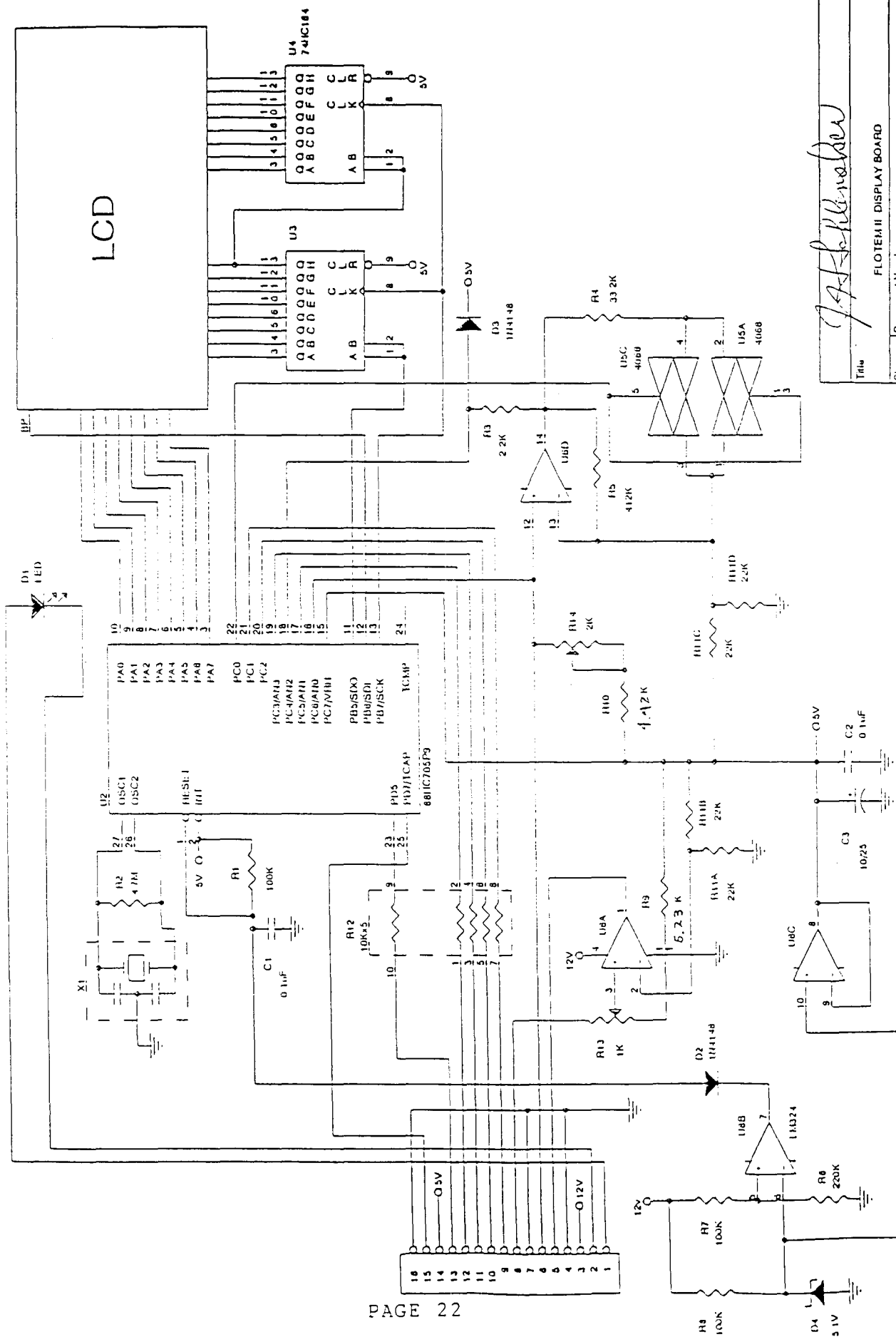


DRWG # 1132

FLCTEM Iie I POWER BOARD LAYOUT

FloTem IIe I Power Board
Parts List

<u>Part Number</u>	<u>Qty</u>	<u>References</u>	<u>Description</u>
100650	1	U4	ULN2003
100750	1	U1	MOC3023 OptoIsolator
103600	1	U3	SG3524
103950	1	U2	4N35 Opto Isolator
110550	4	D6,D7,D8,D9	IN4148
110750	1	D1	IN4004
110760	4	D2,D3,D4,D5	IN4750A27V1W Zener Diode
111000	1	Q1	Teccor Q4004L3 Triac
121150	1	R11,A,B,C,D,E	47K Bussed SIP
121350	1	R4	100 OHM 1/4W 5% Resistor
121650	1	R1	390 OHM 1/4W 5% Resistor
122000	1	R2	1.2K 1/4W 5% Resistor
122500	1	R3	2.7K 1/4W 5% Resistor
123200	1	R6	15K 1/4W 5% Resistor
123350	1	R7 (220 volt)	22K 2W 5% Resistor
123355	1	R7 (110 volt)	4.7K 2W 5% Resistor
123400	1	R5	27K 1/4W 5% Resistor
123900	2	R9,R10	100K 1/4W 5% Resistor
124110	1	R8	220K 1/4W 5% Resistor
130310	1	C5	.001 uF Ceramic Disc Cap
130400	2	C4,C9	.1 uF/50V Ceramic Disc Cap
130405	1	C1	.1 uF/250V Line Bypass Cap
131005	1	C2 (220 volt)	.56 uF/400V MetPly Cap
131050	1	C2 (110 volt)	1 uF/250V MetalPoly Cap
131060	3	C6,C7,C8	10 uF/35V Electro Rad Cap
131250	1	C3	330 uF/35V Electro Rad Cap
150400	1	BZ	Buzzer 12V Star PMB-12
140250	2	TB3,TB4	2 Position Terminal Blk
140300	1	TB1	3 Position Terminal Blk
140400	1	TB2	4 Position Terminal Blk
142008	2	N/A	12 1/4 Stud Solderless Term
143600	1	J1	16 Pin Dip Socket
150625	1	F1 (220 volt)	Lit.fuse 235 1.25A 220V
150650	1	F1 (110 volt)	Lit.fuse 235 2.50A 110V
151150	1	MOV	EZR-CO7DK391U
151505	1	T1	Panasonic ELF-18D270A
151700	1	SW2	NKK MB Push Button Sw.
152010	1	SW1	NKK M2012ES1W06 Toggle Sw.
155100	1	K1	Omron G5L-112PPSDC24 Relay
160200	2	N/A	4-40 Hex Nut
161025	2	N/A	4-40 x 1/2" PPHMS Screw
162004	1	N/A	1/8"Non-Metal Round Spacer
162005	2	N/A	1/4"Non-Metal Round Spacer
162015	1	N/A	3/8"Non-Metal Round Spacer
167008	2	N/A	Littlefuse Fuseclip PCmt.
171001	1	N/A	FloTem IIe Power PCB



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FLOTEM II DISPLAY BOARD

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REV

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FloTem IIe I Display Board
Parts List

<u>Part Number</u>	<u>Qty</u>	<u>Reference</u>	<u>Description</u>
101850	1	U2	MC68HC705P9P
102890	1	U6	LM324
103450	1	U5	4066
105000	2	U3,U4	74HC164
110550	2	D2,D3	IN4148
110560	1	D4	IN4689 5.1V Zener Diode
120000	1	R13	1K 20 Turn Flat Pot
120100	1	R14	2K 20 Turn Flat Pot
121105	1	R12A,B,C,D,E	10K Isolated SIP
121110	1	R11A,B,C,D,	22K Isolated SIP
122300	1	R3	2.2K 1/4W 5% Resistor
123900	3	R1,R7,R8	100K 1/4W 5% Resistor
124110	1	R6	220K 1/4W 5% Resistor
124450	1	R2	4.7M 1/8W 5% Resistor
125003	1	R10	4.42K 1/4W 1% Resistor
125004	1	R9	5.23K 1/4W 1% Resistor
125150	1	R4	33.2K 1/4W 1% Resistor
125350	1	R5	412K 1/4W 1% Resistor
130400	2	C1,C2	.1 uF/50V Ceramic Disc Cap
131060	1	C3	10 uF/35V Electro Axial Cap
150000	1	U1	3 1/2 Digit LCD002VTND
151200	1	D1	Green LED
151450	1	X1	Ceramic Resonator 4MHz
170101	1	N/A	FloTem IIe Display PCB
191406	1	N/A	16 Pin Ribbon Cable Assy

FLOTEM IIe-i COMPLETE ELECTRONIC BOARD ASSEMBLIES

<u>Part Number</u>	<u>Qty</u>	<u>Description</u>
010003	1	FLOTEM IIe-i MAIN BOARD COMPLETE ASSY.
010006	1	FLOTEM IIe-i DISPLAY BOARD COMPLETE ASSY.

FloTem IIe I Main Plate Assembly
Parts List

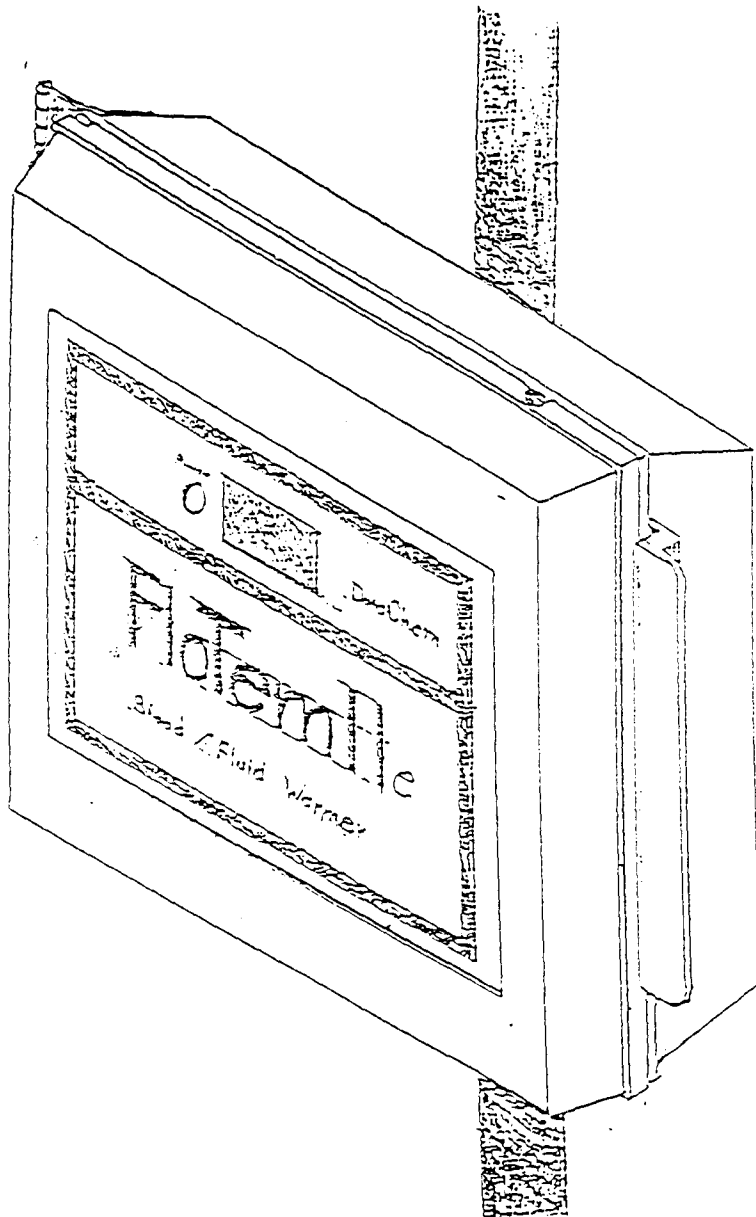
<u>Part Number</u>	<u>Qty</u>	<u>Reference</u>	<u>Description</u>
125800	2	R12,R13	10K Thermistor NTC
152004	1	TH1	Thermostat
152055	1	H1	Main Plate Heat Pad
161000	2	N/A	Screw 4-40x3/8 PHFlat Hd M/S
161235	3	N/A	Screw 6-32x5/8 PHRound Hd M/S
162015	2	N/A	3/8 Round Non-Metal Spacer 6-32
162020	1	N/A	3/8 Round Metal Spacer 6-32
167015	1	N/A	Thermostat Mounting Strap
182151	1	N/A	Main Grooved Plate

FloTem IIe I Display Plate Assembly
Part List

<u>Part Number</u>	<u>Qty</u>	<u>Reference</u>	<u>Description</u>
152004	1	TH2	Thermostat
			Thermal Epoxy
152054	1	H2	Display Plate Heat Pad
161000	2	N/A	Screw 4-40x3/8 PH Flat Hd M/S
161240	3	N/A	Screw 6-32x1/2 PH Round Hd M/S
162000	3	N/A	1/4 Round Metal Spacer 6-32
167015	1	N/A	Thermostat Mounting Strap
182150	1	N/A	Display Grooved Plate

FloTem IIe I Case Assembly
Parts List

<u>Part Number</u>	<u>Description</u>	<u>Qty</u>
160000	1/4X20 Hex Nut Z Plate	2
160600	Dress Nut (Pwr Sw)	1
161800	#6x1/2" Blk Ox Screw	8
166000	5/8" Spring	4
167001	Black Finger Guard	1
167005	"C" Clamp	1
167007	Black Strain Relief	1
182170	FloTem IIe Case W/Hinge	1
192055	15' Power Cord	1
212304	FloTem IIe Front Label	1
212307	FloTem IIe Back Label	1 (110 volt)
212308	FloTem IIe Back Label	1 (220 volt)



FLOTEM EXTERNAL ILLUSTRATION Closed

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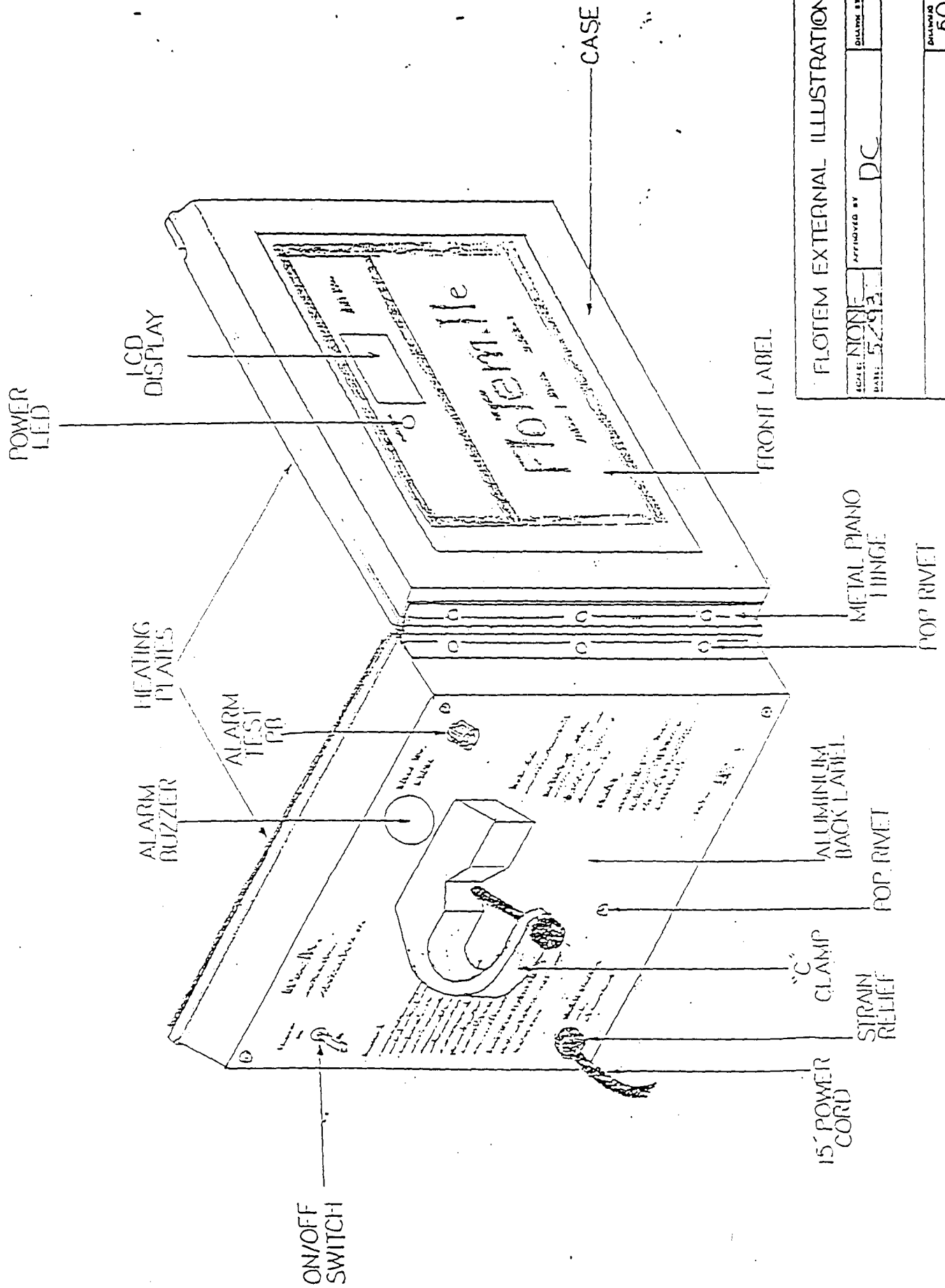
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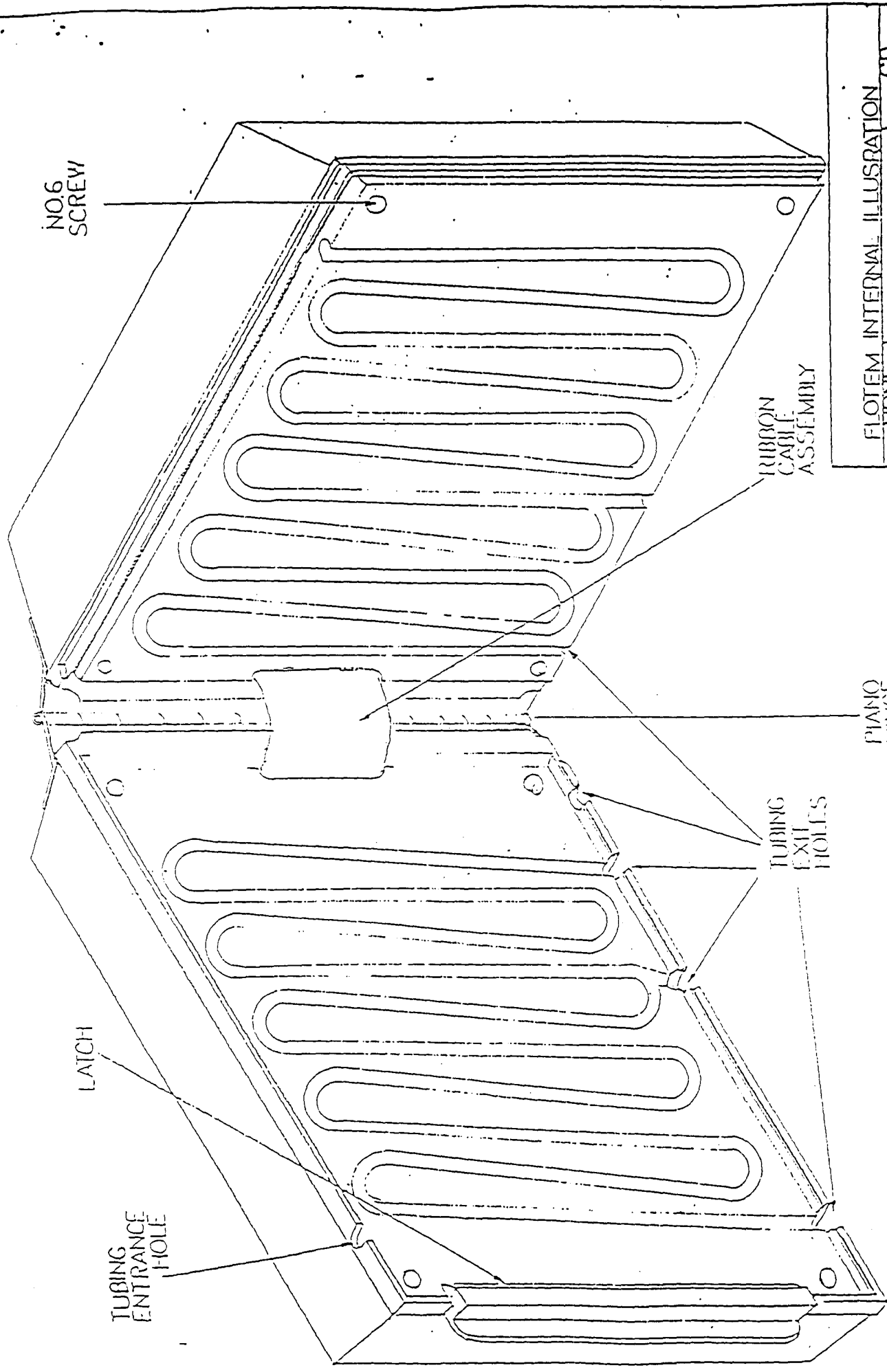
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FLOT-EM EXTERNAL ILLUSTRATION

SCALE: NONE
 DATE: 5/2/92
 APPROVED BY: DC
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 5045



NO6
SCREW

LATCH

TUBING
ENTRANCE
HOLE

RIBBON
CABLE
ASSEMBLY

TUBING
EXIT
HOLES

PIANO
HINGE

FIOTEM INTERNAL ILLUSTRATION

SCALE: NONE APPROVED BY: DC
DATE: 15/4/83

Drawing Number: 5046